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subject to whatever uncertainty remains with regard to astronomical refraction.

As the Astronomer Royal has not been in possession of the instrument a sufficient length of time for deducing the real quantity of refraction from his own observations, he has hitherto employed those of Dr. Bradley, which have been many years in use at the Royal Observatory; but he observes, that any alteration which may be hereafter found necessary, may easily be made as correction to the above observations.

*Observations relative to the near and distant Sight of different Persons.*

*By James Ware, Esq. F.R.S. Read November 19, 1812. [Phil. Trans. 1813, p. 31.]*

The author states, in the first place, that he has rarely observed short-sightedness in children under ten years of age, and that he considers it as commencing generally between that period and eighteen; that it at first occasions so little inconvenience, that it is not noticed by those who have not access to concave glasses, and consequently is very frequently overcome by the natural efforts of the eye. Persons, on the contrary, in the higher ranks of society, who have it more in their power to indulge a slight weakness, by having recourse to short-sighted glasses, soon confirm the imperfection, and in many instances even render it worse, by employing glasses deeper than are necessary.

For the purpose of instituting a comparison between the proportional prevalence of this defect in different classes of society, Mr. Ware made inquiry in the three regiments of Foot Guards, containing nearly 10,000 men, and also in the two Universities, Oxford and Cambridge. In the Guards short-sightedness among the privates is scarcely known; and not more than half a dozen recruits are said to have been rejected for this imperfection in the course of twenty years. In the Universities, on the contrary, the numbers are so considerable, that in one of the colleges in Oxford, it is said that of 127 persons, so many as thirty-two have used either a hand-glass or spectacles. It is thus proved that short-sightedness is corrected in one class of persons, and encouraged in the other; and it is evident that even in those who absolutely require glasses, it may be increased by using such as are deeper than are really necessary, or counteracted by employing the lowest with which the eye can see with comfort.

It is observed, however, that extreme short-sightedness sometimes occurs in children from visible imperfection in the form of the cornea, and sometimes arises as an accidental and temporary consequence of general debility, and is then removable by chalybeate medicines and bracing applications.

Dr. Porterfield has observed, that the pupils of short-sighted persons are in general more dilated than those of others; but Mr. Ware does not admit this to be generally the case; neither does he admit

the common opinion to be well founded, that the magnitude of the pupil varies according to the distance of the object viewed. He names, however, one extraordinary instance of a lady, whose pupil contracts only when she views objects at the distance of nine inches, but at other times is dilated very nearly to the full extent of the rim of the cornea.

Mr. Ware has also made experiments similar to those of Dr. Wells, on the alteration of the power of the eye during that dilatation of the pupil which is produced by the external application of belladonna. Those of the author were attended with the same result of lengthening the focus of either eye to which the belladonna was applied, without affecting the customary range of vision in the other eye.

The author observes, that short-sightedness does not depend on the greater or less concavity of the cornea alone; since its distance from the retina, and the convexity of the crystalline also, must be taken into the account.

It has sometimes been observed, that old persons have in a short time recovered the perfect sight of younger persons; and this has been explained by Dr. Porterfield, by a supposition of the absorption of fat from the bottom of the orbit, allowing the axis of the eye to become more elongated: but Mr. Ware thinks it more likely to have arisen from absorption of the vitreous humour, in consequence of which the sclerotica would be pressed inwards, and that then the axis of the eye would be elongated.

Mr. Ware observes, that persons in general who use glasses, possess the power of seeing both near and distant objects with the same glass, but that this is not the case with those who have been couched, who always require a different glass to enable them to see distant objects; proving thereby that the adapting power of the eye depends on the presence of the crystalline. In consequence of this defect, such persons judge very imperfectly of distances.

In comparing the range of adaptation possessed by short-sighted persons with that of others, the author conceives the range of the former to be much less; his estimate being made by the number of inches through which the range of distinct vision extends.

The author, being himself very short-sighted, remarks, that the change that has taken place in his own eyes by age, does not accord with the observation generally made, that short-sighted persons become less so as they advance in life. In his eyes the shortest distance of distinct vision remains nearly where it was; but the power of discerning distant objects is so far lessened, that for this purpose he requires a glass one degree deeper than that which he commonly employs, and with which he formerly used to distinguish distant as well as near objects; and as he is acquainted with other instances in which a correspondent change has taken place, he is of opinion that such changes are by no means unfrequent. However, in two of those here enumerated, this change was produced by evident disease; and in one of them it was only temporary. A third instance mentioned of an eye becoming less long-sighted, is occasioned by unusual efforts

of adaptation. An instrument-maker, by employing a microscope, for the purpose of dividing with accuracy for several days together, is afterwards able to read without spectacles for a few weeks, but his sight then gradually elongates, till he again has occasion to employ himself in dividing.

Two other cases are also mentioned, of long-sightedness reduced to vision at a moderate distance, both arising from disease, and both speedily relieved by evacuating remedies.

*The Bakerian Lecture. On the elementary Particles of certain Crystals.*

By William Hyde Wollaston, M.D. Sec. R.S. Read November 26, 1812. [*Phil. Trans.* 1813, p. 51.]

In this lecture the author undertakes to explain a difficulty that has occurred in crystallography, respecting the primitive molecule of those bodies that assume the octohedral and tetrahedral forms, when broken in the direction of their natural fractures.

The substance that he selects as most convenient for experiment is fluor spar, which may very readily be divided into any number of acute rhomboids, having the angles of their surfaces  $60^\circ$  and  $120^\circ$ .

These might be regarded for all the practical purposes of crystallography as the integral molecule, and from thence all the other modifications of these solids might very simply be derived.

But it is observed, that each acute rhomboid thus obtained may be again split in a new direction at right angles to its axis, so that a tetrahedron may be detached from each extremity, leaving from between them a regular octohedron.

Consequently this rhomboid cannot be considered as the primitive, and we are left in doubt not only which to prefer of the two last-named solids, but even whether either of these can be primitive; since no possible arrangement of tetrahedra alone, or of octohedra alone, will fill any space without leaving vacuities.

The author having observed that both these forms would result from the arrangement which spheres would most naturally assume by mutual attraction, proposes a theory founded on that observation, which he thinks is not liable to objection, and endeavours to extend this hypothesis, by showing that with some modifications a corresponding theory may be applied to other forms well known to crystallographers.

With regard to the triangular arrangement of balls in a plane, and their tetrahedral grouping in solidity also, he finds that he has been anticipated by that universal genius Dr. Hooke: but he observes, that Dr. Hooke's ideas upon this, as upon many other subjects, are but imperfectly developed; and that he takes no notice of the octohedral group, formed by placing four balls in a square, with one above and one beneath them. Accordingly, Dr. Hooke could know nothing of that which forms the principal novelty of the present observation, namely, that when a mass of spheres has been formed wholly according to the triangular or tetrahedral arrangement, then certain sections